



Development, Evaluation and Scaling of Customized Processes for Product Purification

Downstream processing

Downstream thinking

Sustainability doesn't stop at the reaction



At the Fraunhofer Center for Chemical-Biotechnological Processes CBP, we offer comprehensive solutions for the downstream processing and product purification of biotechnological and chemical processes. Our services include the scale-up of downstream processes from laboratory to pilot scale. We use the most modern technologies to develop customized solutions for your individual requirements. For example, we are able to extract high-value products such as furan derivatives or carboxylic acids from secondary and side streams of the renewable resources industry, fermentation broths or isolate organic compounds from chemical process streams.

Customized purification processes for your ideas

We use our knowledge to evaluate and scale-up customized and tailor-made processes for the separation and recovery of valuable products for partners in the chemical, biotechnology and process industries.

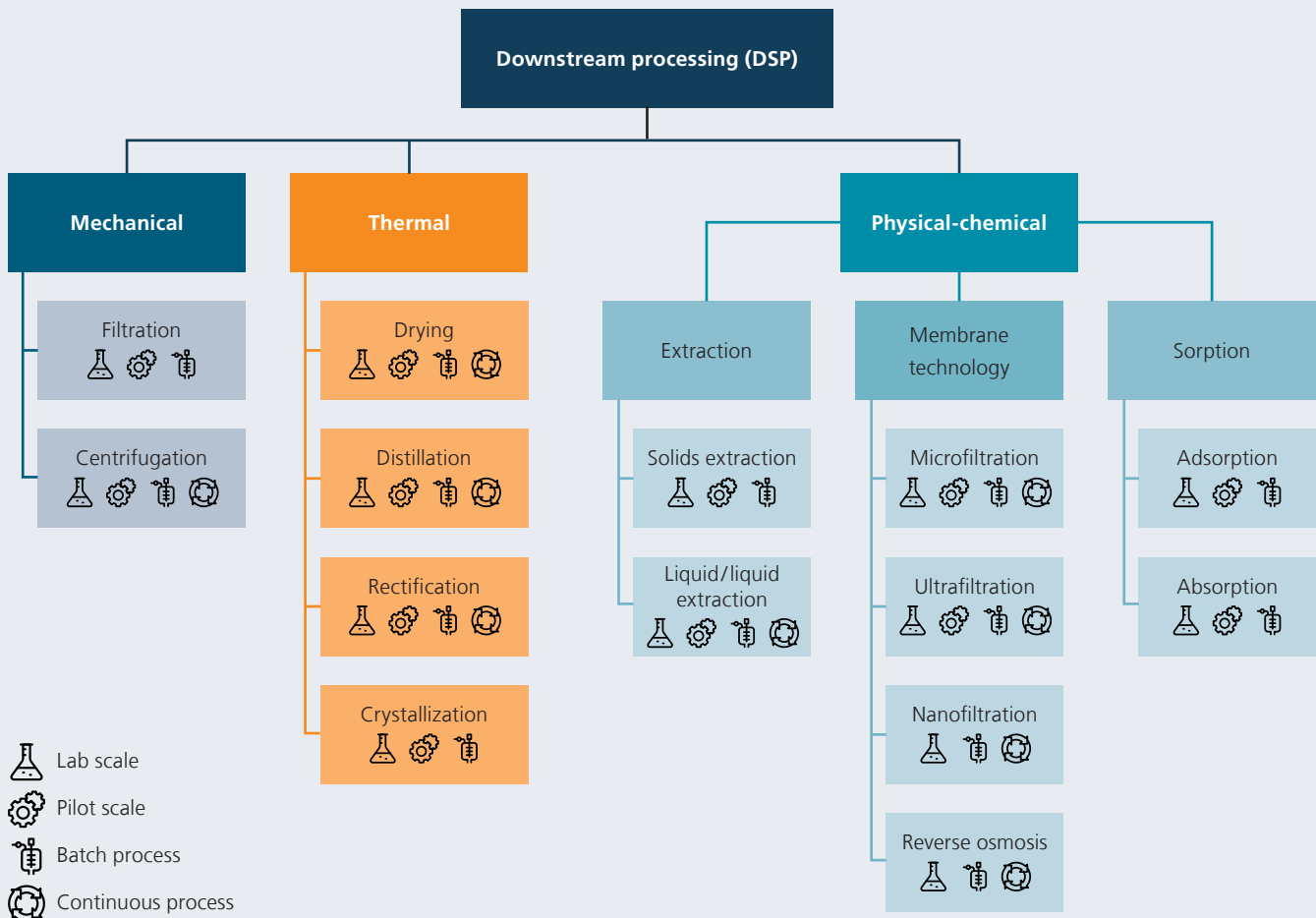
Due to our multi-purpose technical equipment, we can implement processes on a laboratory and pilot scale. These processes can be carried out in either batch or continuous operation.



Downstream processing is a significant cost factor in the production chain."

Dr.-Ing. Jakob Köchermann
Group Manager Chemical Processes

Overview of the equipment available at Fraunhofer CBP for product processing



Range of services

The efficiency of a process for the production of chemicals is significantly influenced by downstream processing, which is why this step must be closely integrated into the process development. Our procedure for developing a downstream process includes the conception and evaluation of suitable separation processes, modeling using simulation software and experimental trials including analytical studies on a laboratory and pilot scale. The data generated can be used to carry out techno-economic assessments and further scaling up to industrial scale.

The experimental investigations enable us to provide our partners with product samples for technical application characterization.

Scale-up and optimization of downstream processing

Our expertise includes a wide range of processing operations that are perfectly aligned with your product requirements. By scaling up your processes to pilot scale, we support you in optimizing your production processes in terms of economy and technology. The following processing technologies are available at Fraunhofer CBP for this purpose.

Thermal purification

Using process technologies such as distillation, rectification, drying etc., mixtures can be separated on the basis of different vapor pressures. A unique feature of Fraunhofer CBP is the ability to perform this process in an explosion-proof atmosphere. Even temperature-sensitive or high-boiling products can be gently separated under vacuum.



Semi-batch vacuum rectification plant for separating temperature-sensitive or high-boiling substances



Continuous vacuum rectification plant with up to 100 theoretical separation stages



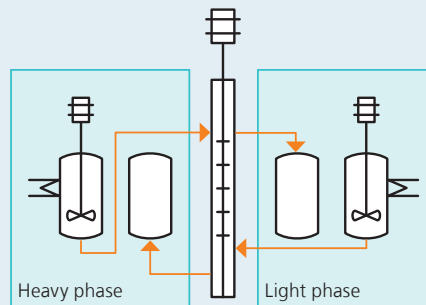
Reaction and distillation plant for the chemical conversion and fractionation of reaction products

Physical-chemical purification

Our core competencies include solvent-based extractions such as solid-liquid extraction and liquid-liquid extraction, as well as pressure-driven non-solvent-based separation techniques such as membrane filtration including nanofiltration and reverse osmosis. We also offer our partners product treatment by adsorption and absorption.



Extraction column with stirrable and heatable product tanks



Liquid-liquid extraction system with agitated countercurrent extraction column



Continuously or discontinuously operating extraction plant, solvents are supercritical CO_2 (co-solvent ethanol possible) and liquefied propane



Membrane plant for the separation of liquid mixtures (microfiltration to reverse osmosis)



Polymer membrane for fractionation of solutions in the field of microfiltration to reverse osmosis



Ceramic membrane for fractionation of solutions in the microfiltration to nanofiltration range



Adsorption column for the purification of liquid mixtures

Mechanical purification

The mechanical purification of liquid mixtures such as suspensions and emulsions requires processes to separate solids and liquids by filtration and centrifugation. Vacuum drum filters and filter presses use pressure differences to remove solid particles from liquids, while disc separators use centrifugal forces to efficiently separate substances of different densities. With our expertise in this field, we can support you in developing and further optimizing your process.



Disc separator for continuous separation of suspensions

Analytical methods for process monitoring

We offer analytical measurements for the continuous monitoring and optimization of your processes. Our analytical methods guarantee the exact determination of key components in your future processes.

Simulation for cost and process optimization

Time and costs are critical factors in process development. We therefore use simulation software to determine optimum process parameters in advance. Simulation allows us to identify the best conditions for distillation, extraction, etc. without the need for costly and time-consuming experiments.

Benefits overview:

- **Time and cost savings:** Reduction of experimental effort through pre-simulation
- **Further cost reduction:** Savings on raw and additional materials
- **Increased efficiency:** Optimum definition of process parameters that lead to higher product quality and yield
- **Safety factor:** Critical process steps can be identified and eliminated in advance

The implementation of process simulation is a key step in modern industrial research and development.

Glossary

- **Distillation:** efficient separation of liquid mixtures with different boiling points
- **Membrane filtration:** separation processes in which compounds are isolated or concentrated on base of their molecular size and a driving force, e.g. pressure
- **Extraction:** removal of target components from liquid mixtures or solids using solvents
- **Crystallization:** chemical separation and purification process in which dissolved components are converted into a solid, ordered crystal structure
- **Adsorption/absorption:** accumulation of chemical components from the liquid phase to an adjacent solid phase



Careful planning can minimize the investment and operating costs of your future process."

Christian Bartsch M. Eng.
Project manager Chemical Processes

Successful together – your partner for scalable solutions

With our many years of experience and the innovative infrastructure at Fraunhofer CBP, we can support you from the initial idea through to pilot production. Take advantage of our expertise in up-scaling downstream processing to make your processes efficient and future-proof. Take advantage from customized solutions that are based on advanced technologies and exactly match your needs.

We are happy to advise you! Please contact us with your challenges to explore solutions together. We look forward to receiving your call or email and will be happy to arrange an initial, informal meeting.

Contact

Dr. Ulrike Junghans
Scientific Management Biorefinery
and Chemistry
Phone +49 3461 43-9128
Mobile +49 173 7182630
ulrike.junghans@cbp.fraunhofer.de

Christian Bartsch M.Eng.
Project Manager Separation Technology
Phone +49 3461 43-9115
christian.bartsch@cbp.fraunhofer.de

Fraunhofer Center for Chemical-
Biotechnological Processes CBP
Am Haupttor, Bau 1251
06237 Leuna
Germany
info@cbp.fraunhofer.de
www.cbp.fraunhofer.de

Stay in contact:

